

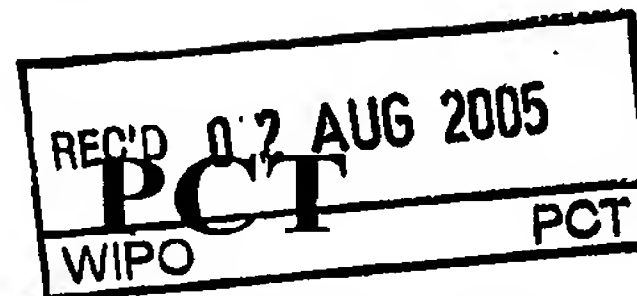
PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

AN, Sang Jeong

512-1906 221, Gumi-dong, Bundang-gu Seongnam-si,
Kyunggi-do 463-715 Republic of Korea



WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing
(day/month/year) 22 JULY 2005 (22.07.2005)

Applicant's or agent's file reference
Out43-1

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/KR2005/000895

International filing date (day/month/year)

25 MARCH 2005 (25.03.2005)

Priority date (day/month/year)

25 MARCH 2004 (25.03.2004)

International Patent Classification (IPC) or both national classification and IPC

IPC7 H01L 33/00

Applicant

LUXELLENT CO., LTD. et al

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.
For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/KR



Korean Intellectual Property Office
920 Dunsan-dong, Seo-gu, Daejeon 302-701,
Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

KIM, Dong Yup

Telephone No. 82-42-481-5749



**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/KR2005/000895

Box No. I Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This opinion has been established on the basis of a translation from the original language into the following language _____, which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material
☐ a sequence listing
☐ table(s) related to the sequence listing
 - b. format of material
☐ in written format
☐ in computer readable form
 - c. time of filing/furnishing
☐ contained in the international application as filed.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/KR2005/000895

**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-20	YES
	Claims	NONE	NO
Inventive step (IS)	Claims	1-20	YES
	Claims	NONE	NO
Industrial applicability (IA)	Claims	1-20	YES
	Claims	NONE	NO

2. Citations and explanations :

1) Reference is made to the following documents:

D1 : JP 9-307190 A D2: JP 9-260726 A D3 : JP 9-326508 A
D4 : JP 2000-101135 A D5 : WO 2005053042 A1

2) Novelty and Inventive Step

The present application is related to a 3-5 light emitting device comprising at least: a n-typed GaN based layer; an active layer; a first p-typed GaN based layer; a carbon-containing layer (SiCN or SiC or CN layer) ; a second p-typed GaN based layer; and a p-electrode.

D1 discloses a semiconductor luminous element comprising: a n-GaN based buffer layer; a n-AlGaIn clad layer ; a n-GaN optical waveguide layer; an InGaIn/InGaIn distortion multiple quantum well activation layer; a p-GaN optical waveguide layer; a p-AlGaIn first clad layer; a n-AlGaIn current prevention layer having a striped current implantation window; a p-AlGaIn second clad layer; a p-GaN cap layer ; and a p-SiC contact layer. Thereafter, a p-side electrode is formed on the p-SiC contact layer. But, D1 is different from this application in a point that there is no GaN based layer on a p-SiC layer.

D2 discloses a GaN based light emitting device in which an electrode at the p-side is formed through a p-typed GaN layer, a first contact layer, and a high-concentration p-typed H-SiC layer. Therefore the p-electrode is not brought into direct contact with a p-type AlGaIn clad layer. Due to this structure, a contact resistance between the electrode and the SiC layer is small and a forward voltage can be lowered. But, D2 is different from this application in a point that there is no GaN based layer on a p-typed SiC layer.

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WRITTEN OPINION OF THE
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International application No.

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Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of :

BOX V.

D3 discloses a light emitting device containing a P-GaN layer, and a carbon added p-AIN layer, and a p-GalnN layer doped with magnesium and a p-electrode. But there is no description for SICN layer on the p-contact(or clad) layer in D3.

In D4, an MgN contact layer consisting of a compound of magnesium with nitrogen formed on the surface of the p-type layer is introduced to a compound semiconductor device. For improving the characteristics of the semiconductor device, carbon to act as an acceptor in a III-V compound semiconductor layer is added to the p-type layer.

D5 discloses a method for forming GaN-based nitride layer to enhance the cohesion of a SiC buffer layer and a GaN-based nitride layer by forming a wetting layer on the SiC buffer layer.

None of the documents D1-D5 refer to a 3-5 light emitting device comprising: a n-typed GaN based layer; an active layer; a first p-typed GaN based layer; a carbon-containing layer; and a second p-typed GaN based layer formed successively.

D1-D5 are thus considered to be little relevant to the present application.

Compared with the prior arts as cited in the International Search Report, the present invention(claims 1-20) is believed to be novel and to involve an inventive step under PCT Article 33(2) and 33(3).

3) Industrial Applicability

And the present invention has industrial applicability under PCT Article 33(4).

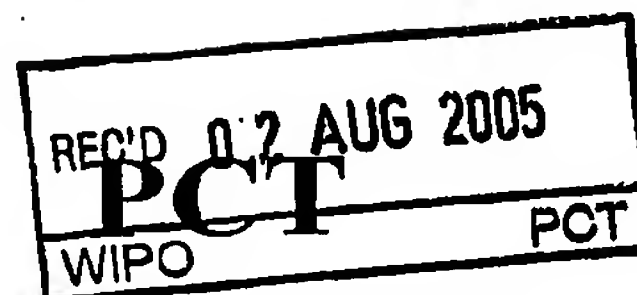
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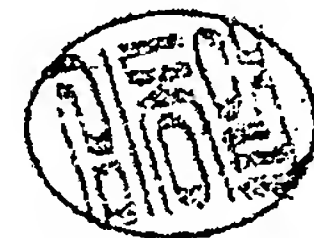
Korean Intellectual Property Office
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**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-20	YES
	Claims	NONE	NO
Inventive step (IS)	Claims	1-20	YES
	Claims	NONE	NO
Industrial applicability (IA)	Claims	1-20	YES
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But, D1 is different from this application in a point that there is no GaN based layer on a p-SiC layer.

D2 discloses a GaN based light emitting device in which an electrode at the p-side is formed through a p-typed GaN layer, a first contact layer, and a high-concentration p-typed H-SiC layer. Therefore the p-electrode is not brought into direct contact with a p-type AlGaIn clad layer. Due to this structure, a contact resistance between the electrode and the SiC layer is small and a forward voltage can be lowered.

But, D2 is different from this application in a point that there is no GaN based layer on a p-typed SiC layer.

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3) Industrial Applicability

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